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Minimum competencies
Series (T) I

Minimum Vocational Competencies Based Curriculum

ENGINEERING DRAFTING AND DUPLICATING.

Vocationalization of Education Unit
National Council of Educational Research & Training
Sri Aurobindo Marg, New Delhi - 16.

Name of the Vocation - Engineering Drafting and Duplicating

Job opportunities :

1. Self - employment in duplicating and drafting.
2. Draftsman in industries
3. Drawing teacher in Schools and I.T.I.
4. Ferro printer/Duplicator in Industries, and schools/college

Activites

1. Self-employment in duplicating and drafting.

- To take up jobs in blueprinting xeroxing and drawing.
- To work as draftsman for making drawings.
- To analyse drawings and blue-prints.

2. Draftsman in Industries.

- To make drawings of machines.
- Reading and analysing for drawings.
- To help in designing.

3. Drawing teacher in schools and I.T.I.

- To teach drawing to the students
- To make drawing required in school.
- To handle the reproduction and duplicating work.

4. Draftsman in college/universities/Office.

- To work as draftsman.
- To work as duplicator/ferro printer.

ob Description/Activity	Knowledge	Skills	Personality Traits
Self-employment in duplicating and drafting			
To take up drawing, blue printing and xeroxing jobs	- Description of drawing equipment	Ability to use	- Hard work
	- Description of IS 696-1972 code	Ability to use	- Sincerity
To work as draftsman	- Description of planning the layout of drawing.	Ability to plan	- Punctuality
	- Description of lettering and dimensioning	Ability of perdorm	- Accuracy
	- Description of geometrical construction and curves	Ability to draw	- Cleanliness
			- Good conduct
To analyse drawing and blue prints	- Description of projections of points, lines, solids	Ability to draw	
	- Description of section of solids.		
	- Description of orthographic projection		
	- Description of symbols and connections	Ability to distinguish	
	- Description of fasteners	Ability to draw	

1	2	3	4
	- Description of sectional orthographic projections	Ability to draw	
	- Description of development of surface	Ability to perform	
	- Description of intersection of surface		
	- Description of production drawings		
	- Description of assembly drawings		
	- Description of design of simple parts like bolts joints, couplings, shaft and levers	Ability to design	
	- Description of blue printing machine and material	Ability take out blue prints	
	- Description of ammonia printing machine	Ability to take out ammonia prints	
	- Description of xeroxing machine	Ability to detect and rectify defects in various machines	
		Ability to carry out minor repairs by using handtools.	

1	2	3	4
DRAFTSMAN IN INDUSTRIES			
Performing all the jobs of the person undertaking self employment venture	Refer to the corresponding job Description	Refer to the corresponding Job Description	Personality traits
To make drawing of machines	Refer to the corresponding Job Description	Refer to the corresponding Job Description	To distinguish hard work Accuracy Sincerity Punctuality Cleanliness
Reading and analysing of drawings	"	"	Discipline
To help in designing	"	"	Good conduct Dignity of labour
DRAWING TEACHER IN SCHOOLS AND I.T.I.			
Performing all the job of the person undertaking self employment venture	Refer to the corresponding Job Description	Refer to the Corresponding Job Description	Personality traits

1	2	3	4
each drawing to the ants	Refer to the correspon-ding Job Description	Refer to the Correspon-ding Job Description	Sincerity, Punctuality, Carefulness.
ake drawing required school	"	"	Cleanliness Discipline Good conduct
andle the reproduction duplicating work	"	"	To distinguish Hardwork

1	2	3	4
DRAFTSMAN IN COLLEGES/UNIVERSITIES/OFFICES			
Performing all the jobs of the person undertaking self employment venture	Refer to the corresponding Job Description	Refer to the corresponding Job Description	Personality traits.
To work as draftsman	"	"	Hardwork Sincerity Punctuality Dignity of labour
To work as duplicator	"	"	To distinguish Accuracy Carefulness Cleanliness Good conduct

MARKING SCHEME

Paper	Subject	Theory Marks	Theory Periods	Practicals Marks	Practicals Period	Total Marks
	Standard XI					
I.	Engineering Drawing I	100	75	100	125	200
II.	Engineering Drawing II	100	95	100	105	200
III.	Mechanical Technology	100	70	100	130	200
		300		300		600
	Standard XII					
IV.	Machine Drawing	100	70	100	130	200
V.	Elements of Design	100	60	100	140	200
VI.	Drafting, Reproduction and Duplicating	100	50	100	150	200
		300		300		600

Standard XI
Paper I

Engineering Drawing I
(THEORY)

Max. Marks 100
Period 75

1. Introduction: Description of drawing equipment/instrument and its use, technique for handling instruments. Selection of equipment/instruments. Description of drafting machine and its usage.

2. Planning and layout of Drawings: Need for planning, standard sizes of drawing sheets, margins, title blocks and material list according to IS 696-1972, Standard practice of following the prints and planning the working spaces of the drawing sheet. Scales-simple and diagonal.

3. Lines, lettering and dimensions: Different types of lines and their usage. Standard practices for writing single stroke vertical and inclined capital and lower case letters and numerals. Need of dimensioning, principles of dimensioning, different systems of dimensioning. Arrangement of dimensions.

4. Geometrical Constructions: Proedure for drawing regular polygons and tangential constructions using circles and straight lines.

5. Engineering Courses: Meaning of terms like focus, directrix, eccentricity, conic sections, directing circle, generating circle, cycloid, Epi and hype cycloid, involute, spiral, helix and simple harmonic construction and application of each curve.

6. A. Projections of points and lines : Description of various positions of lines with respect to Horizantal Plane and Vertical Plane Projection of line when inclined to both the planes. Procedure to find True Length and inclination with Horizental Plane and Vertical Plane; Traces.

   B. Projections of Planes: Projections of planes such as triangle, square regular pentagon, regular hexagon, rectangle and circle.

   C. Projection of Solids: Description and solids like cube, prism, pyramids, tetrahedron, cones and cylinders Various position of Solids placed on ground or V.P. Projections of solids when axis inclined to both the planes. (Use Third angle Projection method)

7. Section of Solids: Need for sectioning and sectional views, Horizontal Trace and Vertical Trace of cutting planes. Procedure of drawing sectional solids (cube, prism, pyramind, cyclinder, cone) when solid rest on base, Procedure of drawing sectional views of solids when axis is inclined to one plane & parallel to other.

PRACTICALS

Max. Marks 100
Period 125

Use of instruments

Lines, Lettering and Dimensioning

Geometrical Construction (with write up of problems)

Engineering Curves.
(with write up of problems)

Projection of lines
(with write up of problems)

Projection of planes,
(with write up of problems)

Projection of Solids.
(with write up of Problems)

Section of solids
(with write up of problems)

Standard XI
Paper II

Engineering Drawing II
(THEORY)

Max. Marks 100
Period 95

1. Orthographic Projections:

Meaning of H.P., Quadrants, I angle & III angle Projection methods, Projections (F.V. T.V. & S.V.) Of simple m/c components.

2. Symbols and Conventions:

Necessity of symbols & conventions, conventions for
(a) brick work, R.C.C., stone, wood, earth, rock, plaster, glass, fiber board, doors, windows, staircase
(b) valve, pumps, screw threads, springs, knurling, holes on linear pitch & circular pitch, gears, bearings
(c) bulb, Fuse, earthing, plug, socket, switch, cell, conductor, resistance, capacitance, inductance, ammeter, voltmeter, bell, buzzer, loud speaker, fans, regulator.

3. Fasteners:

a. Meaning/defitions of pitch, crest, root, depth of thread, minor diameter & major diameter of screw threads.

b. Freehand sketches of bolts, nuts, washers.

c. Freehand sketches of riveted joints.

d. Freehand sketches of studs, set screws, and forms of threads like British Association, British Standard Whitworth, Square, Butterss, Unified, sellers.

e. Freehand sketches of locking nuts.

f. Freehand sketches of foundation bolts like eye bolt, lewis, Rag, Cotter.

g. Freehand sketches of key like square, rectangular, sunk, flat & round, saddle, Gib headed key.

Sectional orthographic Projections :-

Need for sectional views, procedure for drawing sectional views from the given orthographic projections, Sectioning of splines, adjacent components, off set sections, conventions for drawing pulley arms,keys, pins, ribs etc.

Development of Surfaces of Solids :-

Importance of development, list out the applications where developed surface are used.

Differentiate between parallel line and radial line development. Selection of proper methods of development, procedure for drawing the development of simple and truncated solids. Development of the surfaces of funnel, elbow, T pipe joints & some practical problems.

Intersection of Surfaces :-

Meaning of intersection (interpenetration) of surfaces, List out the application where lines of intersection are used. Differentate between line method and cutting plane method of determining the lines of intersection, procedure to draw lines of intersection for the following cases:

a. Prism
   1. axes perpendicular & intersecting
   2. axes inclined & intersecting

3. axes not intersecting.

b. Cylinder with cylinder & prism.

1. axes of penetrating cylinder and prism parallel to both planes & intersecting the axis of penetrated cylinder.
2. axis of penetrating cylinder & Prism parallel to both the planes & not intersecting the axis of penetrated cylinder.
3. axis of penetrating cylinder and prism inclined to one plane & parallel to other, intersecting the axis of vertical cylinder.

c. Cone with Cylinder :

1. Axis of cylinder parallel to both the planes.
   a. axes intersecting
   b. axes off-set.
2. Axis of cylinder is parallel to the axis of cone.
   a. Plane containing both the axes parallel to V.P.
   b. Plane containing both the axes perpendicular to V.P.
   c. Plane containing both the axes inclined to V.P.

Std; XI

PRACTICALS

Marks 100
Periods 105

ORTHOGRAPHIC
Projections
(first Angle)

ORTHOGRAPHIC
Projection
(Third Angle)

Symbols and
conventions

Fasteners

Sectional orthographic
Projection

Development of surfaces

Intersections of solids.

Standard XI Mechanical Technology Max. Marks 100
Paper III (THEORY) Period 70

MECHANICAL TECHNOLOGY (THEORY)

1. Description of hand tools in fitting shop
2. Description of tools for sheet metal shop
3. Description of measuring tools and instruments like outside calliper, inside calliper, zeni calliper, Vernier calliper, outside micrometer.
4. Description of surfacing, Sliding & Screw Cutting Lathe & single point cutting tools.

PRACTICALS Max. Marks 100
Period 130

1. To make the given job in the fitting shop by using hand tools
2. To make the given job in the sheetmenal shop by using various tools.
3. Use of measuring tools and instruments namely outside calliper, inside calliper, odd-log calliper, vernier calliper and outside micrometer.
4. To make job which requires
   - a. Plain turning
   - b. Taper turning
   - c. Parting of the job
   - d. Facing and undercutting
   - e. Extenal Threading.

Standard XII
Paper IV

Machine Drawing
(THEORY)

Max. Marks 100
Period 70

1. Pictorial Drawing:
   - a. Limitation of orthographic projections. Difference between;
     - i. Axonometric and Oblique drawing.
     - ii. Isometric and diametric projection.
     - iii. Isometric drawing and isometric projection.
   - b. Procedure for drawing isometric drawing/projection for circle, arc and irregual curves.
   - c. Procedure for drawing isometric drawing/projection from the orthograhic projections.
   - d. Procedure for drawing cavalier and cabinet oblique drawing from the given orthographic projections.
   - e. Procedure for drawing perspective drawing.

2. Symbols and Conventions:
   - i. Symbolic representation of surface roughness, machining, production method, roughness grade, sampling length, direction of lay etc.
   - ii. Symbolic represenatation of pipe fittings and valves.
   - iii. Welding symbols.

3. Tolerances:

   Need of fits, limits and tolerances. Basic size, deviations, tolerances, allowances, deviations, fit, interference fit, and transition fit, Hole basis and shaft basis system. Procedure for indicating above fits on drawing.

4. Production Drawing:
   - i. Types of drawing procedure of drawing according to I.S. 696-1972.

ii. Explanation of information provided in drawing such as scale, finish, tolerance, processes, material list. etc.

iii. Information needed for forging shop drawing such as scale, finish, tolerance etc.

iv. Information needed for m/c shop drawing such as dimensions, shop processes, machining detail, finish, tolerance, heat treatment etc.

v. Procedure for preparation of the following drawings.

   a. Pattern shop drawing

   b. Forging shop drawing

   c. Machine shop drawing

5. Assembly drawing:

i. Difference between details and assembly drawing with the help of the production drawing.

ii. Type of information in detailed drawing.

iii. Procedure for preparation of detailed and assembly drawings of machine parts like bench vice, pipe vice, joints, couplings, bearings, stuffing box, valves, tailstock, I.C. Engine and steam Engine parts.

PRACTICALS

Max. Marks 100
Period 130

Pictorial Drawing (surf-aces)

- do - (Orthographic views)

- do - (- do -)

- do - (- do -)

Symbols & Conventions

Tolerances

Production Drawing

Detailed Drawing

Detailed drawing

Assembly of details drawing No. 8

Assembly of details drawing No. 9

Standard XII | Elements of Design | Max. Marks 100
Paper V | (THEORY) | Period 60

1. Stresses and failure of components

Tensile stress, Compression and shear stress, different modes of failure of the machine parts like tensile failure, crushing failure, shear failure, fatigue failure, ductile failure, brittle failure etc.

2. Factor of safety and allowable stresses:

Necessity of factor of safety, criterion for selection of factor of safety values of factor of safety for the design of shafts, rods, levers, etc. Determination of allowable stress for static load fasteners .

3. Design of the following:

Rivet
Bolts
Key
Knuckle joints
Cotter joints
Muff coupling & flanged coupling
Shafts
Levers.

PRACTICAL Max. Marks 100

Period 140

Failure of components (sketches) and drawing.

Design of Riveted joints

Design and drawing of Bolts and Bolted joint

Design of knuckle joint

Design and drawing of cotter joint

Design and drawing of muff coupling

Design and drawing of flanged coupling

Design of shafts having torque and bending load.

Design and drawing of levers and pins.

Standard XII | Drafting, Reproduction and Duplicating | Max. Marks 100
Peroid 50

(THEORY)

1. Graphs and Charts

Advantages of graphical representation. General rules to be followed while preparing a graph. Procedure for preparing the following charts. Bar Chart, pearcentage bar chart pie charts. Procedure for preparing rectiliner graph and identification of semi logarithmic and logarithmic graphs.

2. Tracing

Usage of inking instruments. Tracing paper/Tracing cloth usage and quality Graph-per set.

3. Blue-Printing

Description and working of blue-printing machine and materials.

4. Ammonia - Printing

Chemicals used in ammonia printing. Description of ammonia printing machine.

5. Zeroxing

Description of zeroxing machine. Materials and chemicals used in zeroxing. Procedure of zeroxing, enlargement and reduction.

6. Nomographs

Definition of nomograph and its utility. Construction of parallel nomograph and simple 'N' or 'Z' nomographs.

7. Electrical Drafting:

a. Signs & Symbols: Detailed diagram of bell, field poles, armature.

b. Schematic & Wiring Diagram:

Schematic diagram and point to point wiring diagram of Induction motor control and D.C. motor control.

Wiring diagram of panel Boards including control and metering.

House wiring.

PRACTICALS

Max. Marks 100
Period 150

Drawing of Charts (I Sheet)

Tracing of sheel No. 1 of m/c Drawing

" of sheet No. 2 of m/c Drg.

" " No. 3 "

" " No. 4 "

" " No. 5 "

" " No. 6 "

" " No. 7 "

" " No. 8 "

" " No. 9 "

" " No. 10 "

" " No. 11 "

Ammonia printing of at least 5 sheets from above tracings

Reduction of tracing on Zerox machine of at least 5 sheets

Drawing of nomographs

Drawing of practical layout for House wiring and panel board wiring

* NOTE 100 marks for T.W.
50 Marks for ORAL